**Air Quality**
**PERMIT TO CONSTRUCT**
**State of Idaho**
**Department of Environmental Quality**

**PERMIT No.:** P-2007.0043
**FACILITY ID No.:** 011-00022
**AQCR:** 61 **CLASS:** A
**SIC:** 8733 **ZONE:** 12
**UTM COORDINATE (km):** 366.2, 4828.2

1. **PERMITTEE**
U.S. Department of Energy, Idaho Operations Office (DOE-ID)

2. **PROJECT**
Materials and Fuels Complex (MFC) Fuel Conditioning Facility (FCF)

| 3. **MAILING ADDRESS** | **CITY** | **STATE** | **ZIP** |
|---|---|---|---|
| 1955 Fremont Avenue | Idaho Falls | ID | 83415 |

| 4. **FACILITY CONTACT/TITLE** | **TELEPHONE** |
|---|---|
| Timothy A. Miller,<br>Program Environmental Lead—MFC, Battelle Energy Alliance | (208) 533-7741 |

| 5. **RESPONSIBLE OFFICIAL/TITLE** | **TELEPHONE** |
|---|---|
| Manager, Department of Energy-Idaho Operations Office<br>Vice President, Battelle Energy Alliance, LLC | (Obtain telephone numbers through facility contact if necessary) |

| 6. **EXACT PLANT LOCATION** | **COUNTY** |
|---|---|
| Scoville, Idaho. 35 miles west of Idaho Falls on U.S. Highway 20, 3.4 miles north on Taylor Blvd. | Bingham |

7. **GENERAL NATURE OF BUSINESS & KINDS OF PRODUCTS**
Spent Fuel Treatment and Nuclear Energy Research and Development

8. **PERMIT AUTHORITY**

This permit is issued according to the Rules for the Control of Air Pollution in Idaho, IDAPA 58.01.01.200 through 228, and pertains only to emissions of air contaminants regulated by the state of Idaho and to the sources specifically allowed to be constructed or modified by this permit.

This permit (a) does not affect the title of the premises upon which the equipment is to be located; (b) does not release the permittee from any liability for any loss due to damage to person or property caused by, resulting from, or arising out of the design, installation, maintenance, or operation of the proposed equipment; (c) does not release the permittee from compliance with other applicable federal, state, tribal, or local laws, regulations, or ordinances; (d) in no manner implies or suggests that the Department of Environmental Quality (DEQ) or its officers, agents, or employees, assume any liability, directly or indirectly, for any loss due to damage to person or property caused by, resulting from, or arising out of design, installation, maintenance, or operation of the proposed equipment.

This permit will expire if construction has not begun within two years of its issue date or if construction is suspended for one year.

This permit has been granted on the basis of design information presented with its application. Changes in design, equipment or operations may be considered a modification. Modifications are subject to DEQ review in accordance with IDAPA 58.01.01.200 through 228 of the Rules for the Control of Air Pollution in Idaho.

**CHERYL A. ROBINSON, P.E., PERMIT WRITER**
**DEPARTMENT OF ENVIRONMENTAL QUALITY**

| | |
|---|---|
| **DATE MODIFIED/REVISED:** | PROPOSED for PUBLIC COMMENT |
| **DATE ISSUED:** | December 5, 1989 |

**MIKE SIMON, STATIONARY SOURCE PROGRAM MANAGER**
**DEPARTMENT OF ENVIRONMENTAL QUALITY**

# Table of Contents

# Acronyms, Units, and Chemical Nomenclature

| | |
|---|---|
| AQCR | Air Quality Control Region |
| ANSI | American National Standards Institute |
| ASTM | American Society for Testing and Materials |
| CEMS | continuous emission monitoring system |
| CFR | Code of Federal Regulations |
| DEQ | Department of Environmental Quality |
| DOE-ID | U.S. Department of Energy, Idaho Operations Office |
| DSC | Decon Spray Chamber |
| EBR-II | Experimental Breeder Reactor No. 2 |
| EPA | U.S. Environmental Protection Agency |
| FCF | Fuel Conditioning Facility |
| FEIS | Final Environmental Impact Statement |
| FFTF | Fast Flux Test Facility |
| HEPA | high efficiency particulate air (filter) |
| HRA | hot repair area |
| HRF | hot repair facility |
| IDAPA | a numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act |
| km | kilometer |
| MFC | Materials and Fuels Complex |
| mrem/yr | millirem per year |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| QAPjP | Quality Assurance Project Plan |
| PTC | permit to construct |
| RLWS | Radioactive Liquid Waste System |
| RSFFF | Research Scale Fuel Fabrication Facility |
| scfm | standard cubic feet per minute |
| SERA | Suited Entry Repair Area |
| SES | Safety Exhaust System |
| SIC | Standard Industrial Classification |
| UTM | Universal Transverse Mercator |

# 1. PERMIT TO CONSTRUCT SCOPE

## *Purpose*

1.1 The purpose of this Permit to Construct (PTC) is to:

- Add the following proposed new fuel fabrication capabilities:
  - Research Scale Fuel Fabrication Facility (RSFFF) Metal Fuel Module.
  - Oxide fuel fabrication demonstration capability.
- Delete the 30-day and annual disassembly and processing limits for fuel assemblies processed in the air and argon cells.
- Delete the 10 and 15 percent average heavy metal burnup requirement for spent fuels being treated.
- Revise facility and responsible official contacts for the Materials and Fuel Complex (MFC) Fuel Conditioning Facility (FCF).
- Update the General Provisions to the currently approved version.

1.2 Those permit conditions that have been modified or revised by this permitting action are identified by a date citation located directly under the permit condition and on the right hand margin.

1.3 This PTC replaces PTC Nos. P-011-00022, issued on May 4, 2001 and on May 9, 2001, the terms and conditions of which shall no longer apply.

## *Regulated Sources*

2.1 Table 1.1 lists all sources of regulated emissions in this PTC.

**Table 1.1 SUMMARY OF REGULATED SOURCES**

| Permit Section | Source Description | Emissions Control(s) |
|---|---|---|
| 2 | Building Maintenance Activities in Low-Level Contamination Areas | Building is maintained at a negative pressure relative to outside ambient air.<br>Building Exhaust System HEPA filter, 99.97% efficiency. |
| 2 | Air Cell System | Building Exhaust System HEPA filter on Air Cell inlet ducting.<br>Materials transferred into/out of cell through airlock.<br>Cell is maintained at a negative pressure relative to the building.<br>Two-stage HEPA filter, 99.97% efficiency. |
| 2 | Argon Cell System | Materials transferred into/out of cell through airlock.<br>Cell is maintained at a negative pressure relative to the Air Cell System and building.<br>Two-stage HEPA filter, 99.97% efficiency. |

# 2. MFC FUEL CONDITIONING FACILITY (FCF)

## 2.1 Process Description

The primary mission of the MFC FCF is electrometallurgical treatment of sodium-bonded spent nuclear fuel from EBR-II, Fermi-1, the Fast Flux Test Facility (FFTF), and smaller amounts of other sodium-bonded fuels. The spent fuel inventory is described in a 2000 Final Environmental Impact Statement (FEIS)[1] for sodium-bonded fuels from EBR-II, Fermi-1, FFTF, and from miscellaneous smaller sources.

Current plans also call for the installation of two new processing capabilities. The Research Scale Fuel Fabrication Facility (RSFFF) Metal Fuel Module is a project designed to demonstrate all aspects of remote metal fuel fabrication technology on a small scale. Installation of oxide fuel fabrication capability is also planned to provide a backup capability for a demonstration project proposed to be undertaken at another National Laboratory.

All radiological emissions from the FCF are emitted to the atmosphere through the MFC Main Stack (Source #MFC-764-001, formerly designated ANL-764-001). The MFC Main Stack is a continuously monitored, 200-foot tall stack. Primary FCF emission units that contribute to the MFC Main Stack exhaust include the following:

2.1.1 Building Exhaust System – This system is designed to operate at lower than atmospheric pressure but at pressures higher than contaminated or potentially contaminated areas. Areas exhausted during normal operations include offices, control room, operating corridors and portions of the basement. Air flow from the Building Exhaust System passes through an aerosol tested HEPA filter prior to discharge into the MFC Main Stack.

2.1.2 Air Cell System – The air cell is used primarily for storage and for the disassembly of fuel assemblies into fuel elements prior to further processing in the argon cell, but also has the capability to be used for the assembly of fuel assemblies from fuel elements produced in the argon cell. Routine operations typically include, but are not limited to, the handling of complete fuel assemblies, clad fuel elements, packaged process product, in-cell samples, and remotely handled waste. Fuel pin loading, capsule welding, leak testing, and radiography activities will also be performed within the air cell as part of the fuel fabrication process. Transfer of materials from the air cell to the argon cell is through an airlock which is pumped down (evacuated) to limit the amount of nitrogen and oxygen introduced into the argon cell.

Air for the air cell is brought in through two inlets from the general building area. The air cell and other contaminated areas are maintained at a lower pressure than the building but at higher pressure than the argon cell. An aerosol tested HEPA filter is used to protect against backflow contamination from the air cell to the general building area.

The air cell exhaust system draws air from areas and equipment that are either contaminated or potentially contaminated. These areas include the air cell, cask tunnel, transfer tunnel, the basement hot repair facility (HRF), the roof hot repair area (HRA), the suited entry repair area

[1] July 2000, U.S. Department of Energy, Final Environmental Impact Statement for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel, DOE/EIS-0306, accessed 4/12/2007, http://www.eh.doe.gov/nepa/eis/eis0306/eis0306.htm

(SERA), the decon spray chamber (DSC), the radioactive liquid waste system (RLWS), the argon cell purification and feed/bleed systems, subcell D, glove boxes, air hoods and other contaminated areas within the facility. The air from the air cell exhaust system passes through a two-stage aerosol-tested HEPA filter prior to discharge into the MFC Main Stack.

2.1.3 Argon Cell System – Argon cell operations typically include, but are not limited to: electrometallurgical treatment of sodium-bonded spent nuclear fuel, fuel fabrication and analysis, preparation of radiological waste streams (e.g., salt, cadmium, and cladding hulls) for final disposal, and various other fuels-related work. Actinides recovered from the electrorefining process are used as the primary feedstock for metal fuel fabrication activities in the argon cell.

The argon cell atmosphere provides a satisfactory atmosphere for the production of high grade plutonium and uranium metal fuels. The argon cell is maintained at a negative pressure relative to the entire facility by cooling of the argon atmosphere. The cooling system circulates argon in a closed loop system. Small quantities of air may leak into the argon cell through cell penetrations and from airlock transfers. A purification sidestream is available to catalytically combine oxygen with hydrogen to form water which is captured by a dryer. The purification system off-gases and the argon cell normal exhaust discharge to the air cell system through a two-stage aerosol tested HEPA filter.

A Safety Exhaust System (SES) is used for over and under pressure relief of the argon cell. The SES normally exhausts the subcell areas with all exhaust passing through a two-stage aerosol tested HEPA filter prior to discharge into the MFC Main Stack.

**[Proposed, May 2007]**

## 2.2 Emissions Control Description

**Table 2.1 MFC FCF DESCRIPTION**

| Emissions Unit(s) / Process(es) | Emissions Control Device | Emissions Point |
|---|---|---|
| Building Maintenance Activities in Low-Level Contamination Areas | HEPA filter | MFC Main Stack:<br>Height: 200 feet<br>Exit diameter: 5.1 feet<br>Max exhaust flow: 58,000 scfm<br>Min exhaust velocity: 1,500 ft/min |
| Air Cell System (fuel assembly disassembly in cell, combined with emissions from hot repair facility (HRF), hot repair area (HRA), subcell D, glove boxes, air hoods, and other contaminated areas within the building. | Two-stage HEPA filter system | MFC Main Stack<br>(Source #MFC-764-001, formerly ANL-764-001) |
| Argon Cell System (fuel element chopping, electrorefining process, waste stream preparation for disposal, fuel fabrication) | Two-stage HEPA filter system | MFC Main Stack<br>(Source #MFC-764-001, formerly ANL-764-001) |

## *Emissions Limits*

**2.3 Radionuclide Emissions Limits - NESHAP**

In accordance with 40 CFR 61.92, emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive, in any year, an effective dose equivalent of 10 millirems per year (mrem/yr).

**[40 CFR 61, Subpart H]**

## *Operating Requirements*

**2.4 Throughput Limit**

Processing of sodium-bonded nuclear fuel (driver fuel, blanket fuel, and experimental fuels described in the July 2000 FEIS, DOE/EIS-0306) shall be limited to no more than 5,000 kilograms (11,023 pounds) of fuel per year.

**[IDAPA 58.01.01.211.01, 5/1/94 (State-only Requirement)][Proposed, May 2007]**

**2.5 MFC Main Stack CEMS - NESHAP**

In accordance with 40 CFR 61.93, whenever the facility is operating, the permittee shall have in place, calibrated, and operating, an in-stack continuous emission monitoring system (CEMS) for the measurement of radionuclides from the MFC Main Stack.

**[40 CFR 61, Subpart H]**

**2.6 Process and Building Pressure Differentials**

2.6.1 During routine operations, the air cell shall be maintained at a lower pressure than the building ventilation but higher than the argon cell pressure to preserve flow from the least to the most contaminated areas within the building.

2.6.2 During routine operations, the argon cell shall be maintained at a pressure lower than all other areas of the FCF.

**[IDAPA 58.01.01.211.01, 5/1/94 (State-only Requirement)]**

**2.7 Process and Building HEPA Filter Systems**

2.7.1 The permittee shall install, operate, and maintain a certified aerosol tested HEPA filter system to filter building exhaust system air prior to discharge through the MFC Main Stack.

2.7.2 The permittee shall install, operate, and maintain a two-stage certified aerosol tested HEPA filter systems to filter emissions from the argon cell to the air cell exhaust system.

2.7.3 The permittee shall install, operate, and maintain a two-stage certified aerosol tested HEPA filter system to filter emissions from the air cell exhaust system.

2.7.4 The permittee shall install, operate, and maintain a certified aerosol tested HEPA filter system to protect against backflow contamination from the air cell to the building

2.7.5 Each HEPA filter shall have a minimum particle removal efficiency of no less than 99.97%. If the removal efficiency of a certified HEPA filter or HEPA filter bank, as applicable, falls below 99.97% as determined by ANSI N510 testing, the permittee shall isolate or replace the certified filters within ten (10) days to achieve the minimum required efficiency.

2.7.6 The permittee shall maintain and operate instrumentation to measure the pressure drop across the filter stages. Each certified HEPA filter or HEPA filter bank shall be operated at a pressure drop that is limited to less than 5.0 inches water column. If the total pressure drop across the HEPA filter bank is 5.0 inches water column or greater, the permittee shall isolate or replace the certified filters within ten (10) days to achieve the required pressure drop.

2.7.7 HEPA filter efficiency shall be tested in accordance with the ANSI N510 testing standard. HEPA filters shall be tested in-place within ninety (90) days after installation or replacement and on an annual basis thereafter. All HEPA filters must be pre-tested and certified prior to installation and must meet the performance specifications of DOE-STD-3020-05 and the overpressure and rough handling requirements of ASME AG-1.

**[IDAPA 58.01.01.211.01, 5/1/94 (State-only Requirement)][Proposed, May 2007]**

**2.8 Operations and Maintenance Manual and Quality Assurance Plan Requirements**

2.8.1 Within 60 days after startup of any processing capability, the permittee shall have developed an operations and maintenance (O&M) manual that describes the procedures that will be followed to assure compliance with this permit. This shall include, at a minimum, written procedures that specify how the pressure drop across the filters will be measured, the frequency of pressure drop recording, and the conditions that require change out of the filters. The manual shall remain on site at all times and shall be made available to DEQ representatives upon request.

2.8.2 Within 90 days after issuance of this permit, the permittee shall revise the existing Quality Assurance Project Plan (QAPjP) that describes HEPA filter installation, filter replacement, testing frequency, methods and procedures that will be used to assure that quality and representative data are collected while performing HEPA filter tests, reporting format, and maintenance procedures. The QAPjP shall be based on ANSI N510 guidelines, shall remain on site at all times, and shall be made available to DEQ representatives upon request.

**[IDAPA 58.01.01.211.01, 5/1/94 (State-only Requirement)][Proposed, May 2007]**

## *Monitoring and Recordkeeping Requirements*

**2.9 Throughput Monitoring**

The permittee shall monitor and record the fuel type, fuel source, and amount of nuclear fuel processed, (in kilograms and in pounds) on a daily basis. On a monthly basis, the daily totals shall be summed and added to a monthly running total for the amount of fuel processed in that calendar year.

**[IDAPA 58.01.01.211.01, 5/1/94 (State-only Requirement)] [Proposed, May 2007]**

**2.10 Radionuclide Emission Monitoring - NESHAP**

2.10.1 In accordance with 40 CFR 61.93, whenever the facility is operating, the permittee shall continuously monitor and record radionuclide emissions from the MFC Main Stack.

2.10.2 In accordance with 40 CFR 61.93, the permittee shall determine radionuclide emissions and calculate effective dose equivalent values to members of the public using EPA-approved methods.

**[40 CFR 61, Subpart H]**

**2.11 HEPA Filter Pressure Drop Monitoring**

When in operation, the permittee shall monitor and record the pressure drop across the HEPA filter stages of the HEPA filter systems at least once per day according to written procedures.

**[IDAPA 58.01.01.211.01, 5/1/94 (State-only Requirement)]**

## *Reporting Requirements*

**2.12 Radionuclide Emissions Compliance and Reporting - NESHAP**

The permittee shall submit annual reports and maintain records documenting radionuclide emissions and effective dose equivalent values in accordance with 40 CFR 61.94 and 61.95.

**[40 CFR 61, Subpart H][Proposed, May 2007]**

## 3. PERMIT TO CONSTRUCT GENERAL PROVISIONS

### *General Compliance*

1. The permittee has a continuing duty to comply with all terms and conditions of this permit. All emissions authorized herein shall be consistent with the terms and conditions of this permit and the Rules for the Control of Air Pollution in Idaho. The emissions of any pollutant in excess of the limitations specified herein, or noncompliance with any other condition or limitation contained in this permit, shall constitute a violation of this permit and the Rules for the Control of Air Pollution in Idaho, and the Environmental Protection and Health Act, Idaho Code §39-101, et seq.

**[Idaho Code §39-101, et seq.]**

2. The permittee shall at all times (except as provided in the Rules for the Control of Air Pollution in Idaho) maintain in good working order and operate as efficiently as practicable, all treatment or control facilities or systems installed or used to achieve compliance with the terms and conditions of this permit and other applicable Idaho laws for the control of air pollution.

**[IDAPA 58.01.01.211, 5/1/94]**

3. Nothing in this permit is intended to relieve or exempt the permittee from the responsibility to comply with all applicable local, state, or federal statutes, rules and regulations.

**[IDAPA 58.01.01.212.01, 5/1/94]**

### *Inspection and Entry*

4. Upon presentation of credentials, the permittee shall allow DEQ or an authorized representative of DEQ to do the following:

   a. Enter upon the permittee's premises where an emissions source is located or emissions related activity is conducted, or where records are kept under conditions of this permit;

   b. Have access to and copy, at reasonable times, any records that are kept under the conditions of this permit;

   c. Inspect at reasonable times any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under this permit; and

   d. As authorized by the Idaho Environmental Protection and Health Act, sample or monitor, at reasonable times, substances or parameters for the purpose of determining or ensuring compliance with this permit or applicable requirements.

**[Idaho Code §39-108]**

### *Construction and Operation Notification*

5. The permittee shall furnish DEQ written notifications as follows in accordance with IDAPA 58.01.01.211:

   a. A notification of the date of initiation of construction, within five working days after occurrence;

   b. A notification of the date of any suspension of construction, if such suspension lasts for one year or more;

c. A notification of the anticipated date of initial start-up of the stationary source or facility not more than sixty days or less than thirty days prior to such date;

d. A notification of the actual date of initial start-up of the stationary source or facility within fifteen days after such date; and

e. A notification of the initial date of achieving the maximum production rate, within five working days after occurrence - production rate and date.

**[IDAPA 58.01.01.211, 5/1/94]**

### *Performance Testing*

6. If performance testing (air emissions source test) is required by this permit, the permittee shall provide notice of intent to test to DEQ at least 15 days prior to the scheduled test date or shorter time period as approved by DEQ. DEQ may, at its option, have an observer present at any emissions tests conducted on a source. DEQ requests that such testing not be performed on weekends or state holidays.

   All performance testing shall be conducted in accordance with the procedures in IDAPA 58.01.01.157. Without prior DEQ approval, any alternative testing is conducted solely at the permittee's risk. If the permittee fails to obtain prior written approval by DEQ for any testing deviations, DEQ may determine that the testing does not satisfy the testing requirements. Therefore, at least 30 days prior to conducting any performance test, the permittee is encouraged to submit a performance test protocol to DEQ for approval. The written protocol shall include a description of the test method(s) to be used, an explanation of any or unusual circumstances regarding the proposed test, and the proposed test schedule for conducting and reporting the test.

   Within 30 days following the date in which a performance test required by this permit is concluded, the permittee shall submit to DEQ a performance test report. The written report shall include a description of the process, identification of the test method(s) used, equipment used, all process operating data collected during the test period, and test results, as well as raw test data and associated documentation, including any approved test protocol.

**[IDAPA 58.01.01.157, 4/5/00]**

### *Monitoring and Recordkeeping*

7. The permittee shall maintain sufficient records to ensure compliance with all of the terms and conditions of this permit. Records of monitoring information shall include, but not be limited to the following: (a) the date, place, and times of sampling or measurements; (b) the date analyses were performed; (c) the company or entity that performed the analyses; (d) the analytical techniques or methods used; (e) the results of such analyses; and (f) the operating conditions existing at the time of sampling or measurement. All monitoring records and support information shall be retained for a period of at least five years from the date of the monitoring sample, measurement, report, or application. Supporting information includes, but is not limited to, all calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation and copies of all reports required by this permit. All records required to be maintained by this permit shall be made available in either hard copy or electronic format to DEQ representatives upon request.

**[IDAPA 58.01.01.211, 5/1/94]**

### *Excess Emissions*

8. The permittee shall comply with the procedures and requirements of IDAPA 58.01.01.130-136 for excess emissions due to startup, shutdown, scheduled maintenance, safety measures, upsets and breakdowns.

**[IDAPA 58.01.01.130-136, 4/5/00]**

### *Certification*

9. All documents submitted to DEQ, including, but not limited to, records, monitoring data, supporting information, requests for confidential treatment, testing reports, or compliance certification shall contain a certification by a responsible official. The certification shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document(s) are true, accurate, and complete.

**[IDAPA 58.01.01.123, 5/1/94]**

### *False Statements*

10. No person shall knowingly make any false statement, representation, or certification in any form, notice, or report required under this permit, or any applicable rule or order in force pursuant thereto.

**[IDAPA 58.01.01.125, 3/23/98]**

### *Tampering*

11. No person shall knowingly render inaccurate any monitoring device or method required under this permit or any applicable rule or order in force pursuant thereto.

**[IDAPA 58.01.01.126, 3/23/98]**

### *Transferability*

12. This permit is transferable in accordance with procedures listed in IDAPA 58.01.01.209.06.

**[IDAPA 58.01.01.209.06, 4/11/06]**

### *Severability*

13. The provisions of this permit are severable, and if any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.